Stress Annealing in BGA by Microwave Techniques Application

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The improvement on the reliability of Commercially off The Shelf Electronics (COTS) suitable for space environment is a necessary and an ongoing effort with a great deal of importance for NASA and agencies that use electronics in harsh environments.

The stress that the electronics endure during their lifetime in space leads to failures that may shorten the objectives of missions. This study was performed to evaluate microwave-based techniques for reducing stress in ball grid arrays (BGA) electronics over a wide temperature range. The technique used in this study is based on the selective heating properties of microwaves. This non-conductive volumetric heating allows the annealing of stress by heating locally the more susceptible materials selectively. This technique has been used in a single cavity mode that affects the substrate by energy concentration within the high Q-value of the processing cavity. The stress was evaluated by Moiré pattern analysis. The Moiré evaluation was applied to microwave processed and pristine samples in the temperature from –50 to 150 °C.
The strain pattern shows a reduction in the stress over the whole substrate over the temperature measured. The strain measurement indicates a reduction of the stress on some of the bumps within the BGA depending on location and temperature.